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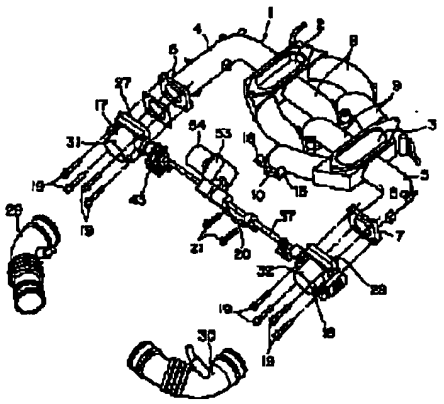
(54) THROTTLE VALVE DRIVING DEVICE OF INTERNAL COMBUSTION ENGINE

(57) Abstract:

PURPOSE: To prevent generation of vibration and deformation and to relieve the burden of the bearing of a throttle body by firmly supporting the intermediate part of a throttle shaft through which a pair of throttle bodies are interlocked with each other.

CONSTITUTION: A pair of throttle bodies 17 and 18 are independently arranged and the throttle valves of the two throttle bodies are simultaneously opened and closed through a throttle shaft 37. The throttle shaft 37 comprises three parts of first and second throttle shafts and an intermediate throttle shaft, which are intercoupled for integral rotation and form a substantially integral one-piece type. A center bracket 20 to support the intermediate part of the throttle shaft 37 is fixed to a boss part 16 at the front end of the intermediate part 10 of a suction manifold upper 1. An electric motor 54 to forcibly close the throttle valve during occurrence of a slip is also supported at the center bracket 20.



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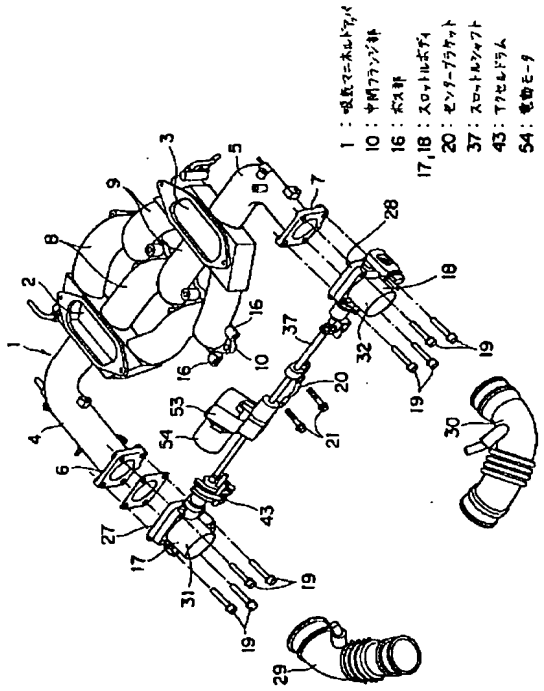
(54)【発明の名称】　内燃機関の絞弁駆動装置

(57)【要約】

【目的】　一対のスロットルボディ１７，１８を連動させるスロットルシャフト３７の中間部を堅固に支持し、その振動，変形を防止するとともに、スロットルボディ１７，１８の軸受の負担を軽減する。

【構成】　一対のスロットルボディ１７，１８が独立して設けられており、一本に連続したスロットルシャフト３７によって両者の絞弁が同時に開閉する。スロットルシャフト３７は、第１，第２スロットルシャフトと中間スロットルシャフトとの３つの部分からなるが、互いに一体に回転するように連結され、実質的に一本に連続した形となっている。スロットルシャフト３７の中間部を支持するセンターブラケット２０は、吸気マニホルドアッパ１の中間フランジ部１０前端のボス部１６に固定されている。スリップ時に絞弁を強制的に閉作動させる電動モータ５４も、センターブラケット２０に支持されている。



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Title: THROTTLE VALVE DRIVING DEVICE OF INTERNAL COMBUSTION ENGINE

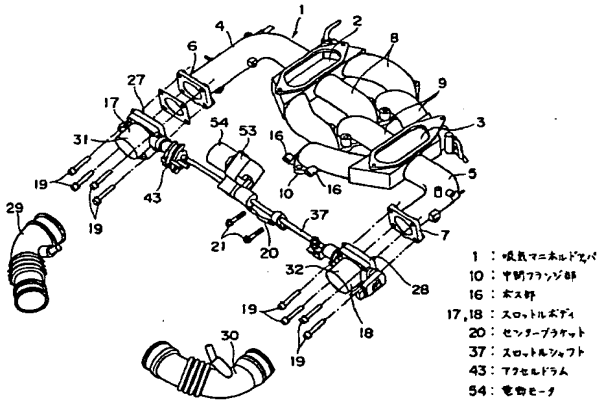
Application Number: 05-003655
Date of filing: 13.01.1993

Inventor: MATSUO YUUYA, OHARA TOSHIKI
Applicant: NISSAN MOTOR CO LTD

[Abstract]

PURPOSE: To prevent generation of vibration and deformation and to relieve the burden of the bearing of a throttle body by firmly supporting the intermediate part of a throttle shaft through which a pair of throttle bodies are interlocked with each other.

CONSTITUTION: A pair of throttle bodies 17 and 18 are independently arranged and the throttle valves of the two throttle bodies are simultaneously opened and closed through a throttle shaft 37. The throttle shaft 37 comprises three parts of first and second throttle shafts and an intermediate throttle shaft, which are intercoupled for integral rotation and form a substantially integral one-piece type. A center bracket 20 to support the intermediate part of the throttle shaft 37 is fixed to a boss part 16 at the front end of the intermediate part 10 of a suction manifold upper 1. An electric motor 54 to forcibly close the throttle valve during occurrence of a slip is also supported at the center bracket 20.



[Claim(s)]

[Claim 1] The inlet manifold which has the inhalation-of-air collector of a pair, and the middle flange which combined the pars intermedia of two or more branch sections of this inlet manifold with one, The throttle body of the pair which was attached in each of the boss section formed in the front end of this middle flange, and the inhalation-of-air collector of a pair, and was equipped with the throttle, respectively, While penetrating both throttle bodies, being arranged, and being located in the pars intermedia of the throttle stem which followed one each throttle is attached, and the throttle body of a pair and supporting throttle-stem pars intermedia pivotable The throttle driving gear of the internal combustion engine characterized by having the center bearing bracket fixed to the above-mentioned boss section.

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the amelioration of an internal combustion engine's throttle driving gear which the throttle of the throttle body of a pair is interlocked with one, and was made to carry out a closing motion drive.

[0002]

[Description of the Prior Art] For example, in the V type internal combustion engine which has the inhalation-of-air collector of a pair, a throttle is prepared in the inlet-port section of each inhalation-of-air collector, respectively, and the throttle driving gear constituted so that an accelerator pedal might be made to follow in the form where both throttles were interlocked with one may be used. While forming an inhalation-of-air collector in JP,60-69255,A for every bank of a V type internal combustion engine as an example, the throttle of each throttle body is attached in the common throttle stem which prepared the throttle body in each inhalation-of-air collector inlet-port section, respectively, and followed one, and the configuration which the throttle of a pair opened and closed to coincidence is shown. In this thing, the above-mentioned throttle body is being fixed to the inhalation-of-air collector, and especially throttle-stem pars intermedia is not supported. That is, throttle-stem both ends serve as a form supported by the throttle body pivotable.

[0003]

[Problem(s) to be Solved by the Invention] With it, the configuration which made only the throttle body support the throttle stem with which the throttle of a pair is connected as mentioned above tends to cause vibration of a throttle stem etc. rather than it is enough as the support rigidity of throttle-stem pars intermedia. Moreover, a big burden must start the bearing of a throttle body and bearing must be enlarged. And minor diameter-ization of the throttle stem itself also becomes difficult.

[0004] In addition, since a throttle stem crosses V bank and is arranged, when it is going to make the cylinder head etc. support pars intermedia temporarily, it is difficult [it] to install the boss section long and slender from this cylinder head etc., and to secure sufficient support rigidity.

[0005]

[Means for Solving the Problem] So, in this invention, the boss section was prepared in an inlet manifold and one, and the center bearing bracket which supports throttle-stem pars intermedia was fixed to this boss section. Namely, the throttle driving gear of the internal combustion engine concerning this invention The inlet manifold which has the inhalation-of-air collector of a pair, and the middle flange which combined the pars intermedia of two or more branch sections of this inlet manifold with one, The throttle body of the pair which was attached in each of the boss section formed in the front end of this middle flange, and the inhalation-of-air collector of a pair, and was equipped with the throttle, respectively, While

penetrating both throttle bodies, being arranged, and being located in the pars intermedia of the throttle stem which followed one each throttle is attached, and the throttle body of a pair and supporting throttle-stem pars intermedia pivotable It is characterized by having the center bearing bracket fixed to the above-mentioned boss section.

[0006]

[Function] The throttle of both throttle bodies interlocks mutually that a common throttle stem is also, and is opened and closed to one. The pars intermedia of this throttle stem is supported by the center bearing bracket pivotable. This center bearing bracket is fixed to the boss section which was united with the inlet manifold. Since the boss section is formed in the front end of the middle flange which combined the pars intermedia of two or more branch sections of an inlet manifold with one, rigidity becomes high very much.

[0007]

[Example] Hereafter, one example of this invention is explained to a detail based on a drawing. This example is what applied this invention to a V type 6-cylinder internal combustion engine's throttle driving gear, and it has composition equipped with the electric motor for traction controls which makes throttle opening small compulsorily at the time of slip detection of a driving wheel while it performs the fundamental closing motion drive of a throttle mechanically by accelerator actuation of an operator especially.

[0008] While drawing 1 shows the inhalation-of-air system of the V type 6-cylinder internal combustion engine having the throttle driving gear concerning this invention and the inhalation-of-air collectors 2 and 3 are formed for every right-and-left bank, respectively, the inhalation-of-air inlet pipes 4 and 5 linked to the center section of each inhalation-of-air collectors 2 and 3 are bent by L typeface toward the same direction, and the flanges 6 and 7 for throttle body attachment are formed in each point. As for the three branch sections 8 and 9 each of each inhalation-of-air collectors 2 and 3, each point is combined with one in the central middle flange 10. That is, the inhalation-of-air collectors 2 and 3 on either side, the branch sections 8 and 9, and the inhalation-of-air inlet pipes 4 and 5 are cast by one as an inlet-manifold upper 1. This inlet-manifold upper 1 is connected with the inhalation-of-air MANIHORU drawer 11 cast independently in the above-mentioned middle flange 10, as shown in drawing 2 . This inhalation-of-air MANIHORU drawer 11 has the above-mentioned branch sections 8 and 9, branch section 8' open for free passage, and 9', and the tip of this each branch section 8' and 9' is connected to each suction ports 14 and 15 of the cylinder heads 12 and 13 of a right-and-left bank. Therefore, the above-mentioned middle flange 10 will be located in the pars intermedia in the condition that up-and-down branch section 8, 8' and 9, and 9' followed one.

[0009] As shown in the front end of the above-mentioned middle flange 10 at drawing 1, the boss section 16 of a pair is formed in bilateral symmetry in the form where the front was turned to. This boss section 16 is located in the height near the upper limit of the cylinder heads 12 and 13, and there is in the center of a right-and-left bank.

[0010] And the throttle bodies 17 and 18 which became independent, respectively are attached each in the flanges 6 and 7 of the inhalation-of-air inlet pipe 4 separated and located in right and left, and five points with four bolts 19. Moreover, the center bearing bracket 20 mentioned later is being fixed to the boss section 16 of the middle flange 10 front end with the bolt 21 of a pair.

[0011] Drawing 3 and drawing 4 show the above-mentioned throttle body 17 and the detail of 18 grades, and each throttle bodies 17 and 18 are equipped with the disc-like throttles 35 and 36, respectively so that it may have the bodies 31 and 32 by which the flanges 27 and 28 and the inlet-pipe ducts 29 and 30 of the abbreviation rectangle by which bolt association is carried out are connected to the inhalation-of-air inlet pipes 4 and 5 and the inhalation-of-air paths 33 and 34 by which penetration formation was carried out may be opened and closed. Although the throttle stem 37 which connects these throttles 35 and 36 of each other is divided in general into three parts, it is connected so that it may rotate to one mutually, and serves as a form which followed one substantially. That is, the 1st throttle stem 38 located in one edge penetrates a throttle body 17, and is arranged, and the throttle 35 is being fixed. Similarly, the 2nd throttle stem 39 located in the other-end section penetrates a throttle body 18, and is arranged, and the throttle 36 is being fixed. And the middle throttle stem 40 located in pars intermedia is connected so that it may rotate to the 1st and 2nd throttle stem 38 and 39 and one through the connection sections 41 and 42 on either side. In addition, each connection sections 41 and 42 have composition of the shape of a kind of swivel joint, and also where some are rocked, smooth rotation transfer is made.

[0012] the end section of the 1st throttle stem 38 which penetrates the throttle body 17 of a drawing left -- in the edge by the side of the middle throttle stem 40, the accelerator drum 43 and the ASCD drum 44 for automobile control are located in a line, and are specifically arranged. Moreover, sequential infixation of the return spring 45 which energizes the 1st throttle stem 38 in the closed direction, the ASCD drum return spring 46 which energizes the ASCD drum 44 in the closed direction, and the lost motion spring 47 is carried out. In addition, the above-mentioned accelerator drum 43 is not fixed to the 1st throttle stem 38, but if the accelerator drum 43 is operated through the accelerator wire which is not illustrated, the motion will be transmitted to the throttle-stem 37 whole through the lost motion spring 47. And the accelerator opening sensor 48 is arranged on the throttle body 17 inferior surface of tongue, and the opening of the accelerator drum 43 is detected

through a link mechanism 49.

[0013] The 2nd throttle stem 39 which penetrates the throttle body 18 of the method of **** did not possess an accelerator drum, but equips the edge by the side of the middle throttle stem 40 only with the return spring 50. Moreover, the throttle opening sensor 51 is arranged at the flank of a throttle body 18 so that direct detection of the angle of rotation of the edge of the opposite side may be carried out. In addition, 52 shows the piston for fast idles to which project when engine cooling water temperature is low, and throttle opening is made to increase.

[0014] The middle throttle stem 40 which constitutes the pars intermedia of a throttle stem 37 is supported by the center bearing bracket 20 pivotable. This center bearing bracket 20 is fixed to the boss section 16 of the middle flange 10 front end of the inlet-manifold upper 1 with the bolt 21 of a pair, as nothing and central base section 20a mentioned above the shape of an abbreviation KO character. Moreover, the gearbox section 53 is formed in the end section of a center bearing bracket 20 at one, and the electric motor 54 is attached here. That axial center has offset to a throttle stem 37, and this electric motor 54 is arranged in parallel, as shown in drawing 5 .

[0015] Drawing 6 and drawing 7 show the configuration inside [gearbox section 53] the above, and the pinion 55 prepared in the shaft of an electric motor 54 has geared to main wheel 56a of the middle gear 56. The middle gear 56 had pinion 56b in main wheel 56a and one, and this pinion 56b has geared on the sector gear 57. This sector gear 57 has become rotatable as a core about the middle throttle stem 40, and is not being fixed to the middle throttle stem 40. And the control lever 58 is being fixed to the middle throttle stem 40, and the edge of the above-mentioned sector gear 57 and the point of this control lever 58 can contact it. In addition, the return spring with which 59 energizes the sector gear 57 to one side, and 60 are bearing which supports the middle throttle stem 40 pivotable.

[0016] Namely, since the sector gear 57 is rotating to an equivalent for the open position of throttles 35 and 36 so that it may illustrate in the state of OFF of an electric motor 54, although the electric motor 54 for traction controls is in an OFF condition and drawing 7 shows the condition that throttles 35 and 36 serve as a close by-pass bulb completely, throttles 35 and 36 will be in the condition that it can rotate freely according to a motion of the accelerator drum 43. That is, in accordance with an operator's intention, switching operation of the throttles 35 and 36 is carried out. On the other hand, if an electric motor 54 carries out ON actuation based on slip detection of a driving wheel etc., since the sector gear 57 will rotate in the direction of a counterclockwise rotation of drawing, the point of a control lever 58 can be pressed and throttles 35 and 36 can be compulsorily operated in the closed direction. In addition, the lost motion spring 47 displaces and accelerator drum 43 the very thing does not move by this condition.

[0017] thus -- according to the configuration of the above-mentioned example -- the pars intermedia of a throttle stem 37 -- since the middle throttle stem 40 is supported by the center bearing bracket 20 pivotable in detail, vibration and deformation of this throttle stem 40 are controlled. Since especially the boss section 16 to which a center bearing bracket 20 is fixed is formed in the middle flange 10 rigid high front end of the inlet-manifold upper 1 at one, it can support a center bearing bracket 20 strongly. Therefore, while the burden of the bearing in throttle bodies 17 and 18 becomes light, smooth actuation of a throttle stem 37 is securable. Moreover, since the electric motor 54 which is a heavy lift is strongly supported by the middle flange 10 of the inlet-manifold upper 1 through a center bearing bracket 20 at coincidence, a burden does not start the attachment section of throttle bodies 17 and 18, but there is no possibility that throttle bodies 17 and 18 may vibrate greatly. And at the time of traction control actuation, although the die length becomes long as a whole, since an electric motor 54 drives the pars intermedia of a throttle stem 37, twist deformation of a throttle stem 37 does not need to become large too much, and a throttle stem 37 becomes advantageous in respect of rigid reservation of a throttle stem 37 etc.

[0018] Moreover, in this example, since the electric motor 54 for traction controls is located in the pars intermedia of the throttle bodies 17 and 18 of a pair, as compared with the case where the electric motor 54 has been arranged, the whole equipment can be miniaturized on the outside of throttle bodies 17 and 18. Since the car center section of the engine hood 61 is high compared with the car both-sides section as shown in drawing 2 supposing it carries the internal combustion engine of this example in a car in FR format especially, sufficient leeway for the electric motor 54 upper part comes be given, and it becomes possible to set up the location of the engine hood 61 comparatively low.

[0019] In addition, in the above-mentioned example, although a throttle driving gear and one are equipped with the electric motor 54 for traction controls, this invention is not limited to this and can be widely applied also to the throttle driving gear it was made to interlock, without providing a traction control system as a throttle stem is also only about the throttle of a Uichi Hidari pair. Moreover, it is applicable not only to the above V type internal combustion engines but a level opposite engine etc.

[0020]

[Effect of the Invention] Since the pars intermedia of the throttle stem which interlocks a throttle body on either side is strongly supported by the inlet manifold through a center bearing bracket by the above explanation according to the throttle driving gear of the internal combustion engine concerning this invention so that clearly, while being able to prevent vibration and deformation of a throttle stem and being able to secure smooth actuation, the burden of the bearing by the side of a

throttle body is mitigated. Since the boss section which fixes a center bearing bracket especially is formed in the middle flange of an inlet manifold at one, very high support rigidity can be secured without being accompanied by the increase of weight of each part.

[Brief Description of the Drawings]

[Drawing 1] The decomposition perspective view of the inhalation-of-air system equipped with the throttle driving gear concerning this invention.

[Drawing 2] The front view of an internal combustion engine important section with which this throttle driving gear is attached.

[Drawing 3] The front view of a throttle driving gear.

[Drawing 4] Similarly it is a top view.

[Drawing 5] The sectional view which met the A-A line of drawing 3 .

[Drawing 6] The sectional view of the gearbox section.

[Drawing 7] The explanatory view showing the relation of each gear.

[Description of Notations]

1 -- Inlet-manifold upper

10 -- Middle flange

11 -- Inhalation-of-air MANIHORU drawer

16 -- Boss section

17 18 -- Throttle body

20 -- Center bearing bracket

37 -- Throttle stem

43 -- Accelerator drum

54 -- Electric motor

[Detailed Description of the Invention]

[0001]

[Field of the Invention] Especially this invention relates to the inhalation-of-air control device of the fuel-injection type engine which has a throttle valve about an engine inhalation-of-air control device.

[0002]

[Description of the Prior Art] general -- internal combustion engines, such as an engine for mount, -- the inside of the cylinder block -- a piston -- a round trip -- it is prepared movable and said piston is connected with an internal combustion engine's crankshaft through the connecting rod. And both-way migration of a piston is changed into rotation of a crankshaft by said connecting rod.

[0003] The cylinder head is attached in said cylinder block, and the combustion chamber is prepared between the cylinder head and the head of a piston. The combustion chamber, the inhalation-of-air path open for free passage, and the flueway are established in the cylinder head. The throttle valve which controls the amount of the air which flows this path, and the injector which injects a fuel into the other inhalation-of-air path to a combustion chamber are formed at this inhalation-of-air path. Moreover, the ignition plug for lighting the mixed gas of a combustion chamber is prepared in said cylinder head.

[0004] While it sets like an internal combustion engine's inhalation-of-air line and air is inhaled by the other inhalation-of-air path to a combustion chamber, a fuel is injected from an injector and a combustion chamber is filled up with the mixed gas which consists of the air and fuel. Then, the mixed gas of a combustion chamber is compressed by migration of a piston in an internal combustion engine's compression stroke. The compressed mixed gas is lit with an ignition plug, and explodes, a piston moves to the above and hard flow by the explosive power, and an internal combustion engine moves like an explosion line. Then, it sets like an internal combustion engine's exhaust air line, and the exhaust gas of a combustion chamber is discharged by migration of a piston through a flueway outside.

[0005] Thus, in the constituted engine, many methods supplied to the gas column of another side which exists gas like an inhalation-of-air line by blowing which was made to open the inhalation-of-air path of the adjacent throttle-valve downstream for free passage with the communicating tube, and was produced in one gas column are proposed in the juxtaposition multiple cylinder engine with which inhalation-of-air timing differs as improvement in fuel consumption and the cure of aggravation prevention of exhaust-air emission are taken in consideration of the environmental problem, for example, it is indicated by JP,2-80726,U in recent years.

[0006] However, since inhalation of air was carried out from the gas column which is open for free passage with the communicating tube even if it was the case where a throttle valve was closed, since the inhalation-of-air path was arranged at the

throttle-valve downstream according to such a method, there was a trouble that the precision of the air content control in which inhalation of air is carried out by the throttle valve may fall.

[0007] Moreover, in the case of the four stroke cycle engine, inhalation-of-air pulsation arises within inhalation of air, and this inhalation-of-air pulsation has become the cause of generating San-ya of torque. There was a trouble that there was little irregularity of a throttle body secret communication way, inhalation-of-air pulsation became remarkable in an engine with the high inhalation-of-air engine performance, and San-ya of torque also became large especially.

[0008]

[Problem(s) to be Solved by the Invention] Then, in order to cancel San-ya of torque and to acquire a smooth torque characteristic, the secondary bulb other than a throttle valve is prepared, and the method which performs optimal inhalation-of-air control by opening and closing a secondary bulb according to an engine operation situation is learned in recent years.

[0009] for example, it is indicated by JP,61-201825,A -- as -- a throttle-valve lower stream of a river -- inlet pipes -- a free passage way -- open for free passage -- further -- the inlet pipe of the throttle-valve upstream -- two forks -- while branching upwards, what carried out the shaft of the secondary throttle valve to one side of this branching path is proposed.

[0010] Since a secondary throttle valve is opened and closed according to an engine speed according to this method, it can be closed at the time of low-speed rotation, and the inspired air volume corresponding to an engine speed can be obtained, and the inhalation-of-air **** return at the time of low-speed rotation can be controlled, it can blow further to the inlet pipe of the gas column which exists like an inhalation-of-air line through a free passage way, and gas can be supplied. However, there was a possibility that it might blow and gas might reach to an air cleaner element since the common path is arranged at the throttle-valve upstream, and further, since the free passage way was arranged on the throttle-valve lower stream of a river, there was a trouble that inhalation-of-air pulsation occurred.

[0011] Moreover, a secondary throttle valve is arranged to the throttle-valve downstream, an inhalation-of-air distribution box is prepared among these two kinds of throttle valves, and what opened the inhalation-of-air path for free passage between each gas column is proposed as indicated by JP,1-159415,A.

[0012] According to this method, since the inhalation-of-air distribution box was open for free passage with the combustion chamber through the 1st inhalation-of-air crossroads, even if it was the case where a secondary throttle valve closed at the time of engine low-speed rotation, it blew and gas had the trouble that there was a possibility of flowing to the throttle-valve upstream.

[0013] This invention is made in view of the above-mentioned conventional trouble,

and it aims at offering the inhalation-of-air control unit of the fuel-injection type engine which blows, reduces the inflow of gas and can prevent early dirt of an air cleaner element while it controls the inhalation-of-air pulsation at the time of engine inhalation of air with an easy configuration and aims at an improvement of output characteristics.

[0014]

[Means for Solving the Problem] While this invention relates to the inhalation-of-air control device of a fuel-injection type engine, having two or more gas columns and having an injector for arranging a throttle body for the inhalation-of-air path of each gas column, and injecting the fuel from a fuel pump to this throttle body In a fuel-injection type engine equipped with the Maine throttle valve opened and closed by throttle actuation of an operator being interlocked with, and the secondary bulb which are opened and closed according to an engine operation situation Said throttle body arranges a secondary bulb to the upstream of the Maine throttle valve, and is characterized by preparing the free passage way which opens the throttle paths between adjoining Maine throttle valves of a throttle body and secondary bulbs for free passage.

[0015] Moreover, when there is a gas column of one side among the gas columns by which the throttle body opened for free passage on a free passage way is arranged like an inhalation-of-air line, as for said engine, it is desirable that an inhalation-of-air line sets up firing order so that the gas column of the other side may serve as a stroke of an except. Moreover, said engine is a four-cycle juxtaposition 4-cylinder engine arranged in order from the 1st cylinder to the 4th cylinder, and it is desirable that firing order of each gas column is performed in 1st cylinder -> 3rd cylinder -> 2nd cylinder -> cylinder [4th] sequence, and the 1st cylinder, the 2nd cylinder, the 3rd cylinder, and the 4th cylinder are respectively opened for free passage by said free passage way. Moreover, as for said free passage way, it is desirable to be arranged on the same flat surface as the flat surface in which the Maine throttle-valve shaft and secondary bulb shafts are prepared.

[0016] According to this invention, the following operations are acquired. That is, in the inhalation-of-air control device of a fuel-injection type engine, the improvement in torque of low medium speed and smooth output characteristics are realizable [at the time of primary bulb full open / in engine low and a middle turn region] by arranging a secondary bulb for the structure of the throttle body arranged at each gas column to the upstream of the Maine throttle valve by closing a secondary bulb moderately with the formation of homogeneity-gaseous mixture, and the improvement in volumetric efficiency and the attenuation of inhalation-of-air pulsation by the improvement in the inhalation-of-air rate of flow. Moreover, it can prevent that inhalation of air blows and gas reaches even an air cleaner element by closing the secondary bulb of the upstream of the Maine throttle valve at the time of

low engine speeds. Furthermore, in a high rotation mold four stroke cycle engine, even if it is the case where an inlet pipe is set up short, it can prevent that inhalation of air blows and gas reaches even an air cleaner element by closing a secondary bulb.

[0017] Moreover, by preparing the free passage way which opens the throttle paths between adjoining Maine throttle valves of a throttle body and secondary bulbs for free passage, air can be inhaled also from the throttle body of the gas column opened for free passage by the free passage way at the time of the Maine throttle-valve full open at the time of low rotation of an engine, and an inhalation-of-air flow rate can be secured. This becomes possible to close a secondary bulb further, and the gas column opened for free passage works as a chamber and can decrease inhalation-of-air pulsation further. While smooth output characteristics are realizable by this, an inhalation-of-air sound can also be reduced.

[0018] Moreover, the Maine throttle valve can control inhalation air only by the Maine throttle valve at the time of partial. The rate of flow goes up by the Maine throttle valve by this, and since a fuel can be sprayed to the high inhalation-of-air flow of the rate of flow, improvement in combustion efficiency can be aimed at.

[0019] Furthermore, for the structure which opens throttle bodies for free passage between the Maine throttle valve and a secondary bulb, since-izing can be carried out [integral construction] in a throttle body Assy, improvement in attachment workability can be aimed at.

[0020] Moreover, since it becomes like the inhalation-of-air line of the timing from which the gas column which is open for free passage on a free passage way differs because an inhalation-of-air line sets up firing order so that the gas column of the other side may serve as a stroke of an except when there is a gas column of one side among the gas columns by which the throttle body opened for free passage on a free passage way is arranged like an inhalation-of-air line, said engine can incorporate inhalation of air from the inlet pipe of another side, when there is one gas column like an inhalation-of-air line. Since a secondary bulb can be closed further, while being able to decrease inhalation-of-air pulsation by this, an inhalation-of-air sound can be reduced.

[0021] Said engine performs firing order of each gas column in 1st cylinder -> 3rd cylinder -> 2nd cylinder -> cylinder [4th] sequence as a four-cycle juxtaposition 4-cylinder engine arranged in order from the 1st cylinder to the 4th cylinder. Moreover, by said free passage way Since it has 360-degree phase contrast and a setup like an inhalation-of-air line is carried out, the gas columns opened for free passage by having opened respectively the 1st cylinder, the 2nd cylinder, the 3rd cylinder, and the 4th cylinder for free passage have the effectiveness of setting like each other inhalation-of-air line, and being easy to decrease inhalation-of-air pulsation.

[0022] Moreover, the dead space near a throttle body can be used effectively by being arranged on the same flat surface as the flat surface where said free passage way is established in the Maine throttle-valve shaft and secondary bulb shafts.

[0023]

[Embodiment of the Invention] Hereafter, the operation gestalt of this invention is explained to a detail with reference to a drawing. The whole side elevation showing the configuration of the whole motor bicycle with which the engine which adopted the inhalation-of-air control device of the fuel-injection type engine which drawing 1 -6 are an example of the gestalt which invents, and drawing 1 requires for the operation gestalt of this invention was carried, The partial cross-section side elevation in which drawing 2 shows the configuration of said engine, the top view showing the configuration of a throttle body [in / in drawing 3 / said inhalation-of-air control device], and drawing 4 are [B view Fig. of drawing 3 and drawing 6 of A view Fig. of drawing 3 and drawing 5] the C-C cross-section view Figs. of drawing 3 .

[0024] As this operation gestalt is shown in drawing 1 , it sets to a motor bicycle 1. To the regio frontalis capitis of the car-body frame 2 The front fork 4 which supports a front wheel 3 to revolve on the pivot shaft 7 which was established free [right-and-left rotation] and constructed over the center section of said car-body frame 2 on the other hand with the handle bar 5 The swing arm 9 which is prolonged back and supports a rear wheel 8 to revolve is supported free [vertical rotation], and the buffer suspension of this swing arm 9 is carried out by the suspension device (illustration abbreviation) prepared in that end face section.

[0025] Said car-body frame 2 has mainframe 2b of a car-body cross direction Hidari [Uichi] pair installed towards an after [a head-tube 2a empty vehicle object cross direction] slanting lower part, and the suspension of the engine 30 is carried out to the front lower part of said car-body frame 2 so that the cylinder head 31 may be arranged between said mainframe 2bs. The power of this engine 30 is transmitted to said rear wheel 8 with a chain 11.

[0026] Said engine 30 is equipped with the inhalation-of-air control unit 100 which has the coolant temperature sensor (illustration abbreviation) which detects engine cooling water temperature, and the electronic control (illustration abbreviation) which carries out closing motion control of the subthrottle valve 52 which is a secondary bulb which carries out a postscript while inputting the detection value from this coolant temperature sensor. Said electronic control is made to make the subthrottle valve 52 fixed time amount full open, when the water temperature inputted at the time of engine starting is lower than the set point.

[0027] The air cleaner 12 is arranged in the upper part of said engine 30. The fuel pump 16 is arranged behind said air cleaner 12. The exhaust pipe 13 of this engine 30 which goes caudad, turns around this engine 30 bottom, and is prolonged back is

connected, further, it is installed toward back along car-body cross direction right-hand side from this the engine 30 bottom, a rear wheel 8 is adjoined, and the exhaust air muffler 14 is connected with the anterior part of this engine 30.

[0028] Moreover, in the meter and electric equipment article which are arranged ahead of said handle bar 5 toward back from the front of said car-body frame 2, the before side cowling 20 is constituted in one with this car-body frame 2 so that said engine 30 and circumference components the side and the bottom may be covered with a wrap. The before side cowling 20 is the mold cast of synthetic resin.

[0029] The radiator 17 is formed ahead of said engine 30, and this radiator 17 is connected to the cooling water pump 18 prepared in the flank of an engine 30 through the cooling water hose 19. A fuel tank 21 is installed in the upper part of said engine 30, and the taking-a-seat sheet 22 is laid in the posterior part of this fuel tank 21 removable. The lower part and the posterior part perimeter of this taking-a-seat sheet 22 are covered with the posterior part frame cover 23. Said posterior part frame cover 23 is the mold cast of synthetic resin.

[0030] Said engine 30 is a four-cycle juxtaposition 4-cylinder engine arranged in order from the 1st cylinder to the 4th cylinder, and firing order of each gas column is performed in 1st cylinder -> 3rd cylinder -> 2nd cylinder -> cylinder [4th] sequence. internal structure is shown in drawing 2 -- as -- the inside of a cylinder block 32 -- a piston 33 -- a round trip -- it is prepared movable and this piston 33 is connected with the crankshaft 35 which is the output shaft of an engine 30 through the connecting rod 34. Both-way migration of said piston 33 is changed into rotation of a crankshaft 35 by this connecting rod 34. The cylinder head 31 is formed in the upper limit of a cylinder block 32.

[0031] A combustion chamber 36 is formed between said cylinder heads 31 and pistons 33, and the combustion chamber 36, the suction port 37 open for free passage, and the exhaust air port 38 are established in this cylinder head 31. The intake valve 39 and the exhaust air bulb 40 are formed in these suction ports 37 and the exhaust air port 38, respectively.

[0032] The inhalation-of-air cam shaft 41 and the exhaust air cam shaft 42 for carrying out the closing motion drive of an intake valve 39 and the exhaust air bulb 40 are supported pivotable by said cylinder head 31. Said inhalation-of-air cam shaft 41 and the exhaust air cam shaft 42 are connected with a crankshaft 35 through a timing belt (illustration abbreviation), and rotation of a crankshaft 35 is transmitted to the inhalation-of-air cam shaft 41 and the exhaust air cam shaft 42 by this timing belt. And if said inhalation-of-air cam shaft 41 rotates, the closing motion drive of the intake valve 39 will be carried out, and a suction port 37 and a combustion chamber 36 will be opened for free passage / intercepted. Moreover, if the exhaust air cam shaft 42 rotates, the closing motion drive of the exhaust air bulb 40 will be carried out, and the exhaust air port 38 and a combustion chamber

36 will be opened for free passage / intercepted.

[0033] The intake manifold 45 and the exhaust manifold 46 are connected to said suction port 37 and the exhaust air port 38, respectively. The inside of this intake manifold 45 and a suction port 37 serves as the inhalation-of-air path 47, and the inside of an exhaust manifold 46 and the exhaust air port 38 serves as a flueway 48. Said inhalation-of-air path 47 is formed toward the back of an engine 30, and said flueway 48 is formed toward the front of an engine 30. The throttle body 50 is arranged at the upper section of an intake manifold 45.

[0034] As shown in drawing 2 -6, corresponding to each gas column, the throttle body bodies 50a, 50b, 50c, and 50d of four bodies arrange said throttle body 50 in parallel, it is arranged, and the Maine throttle valve 51 which is interlocked with actuation of said throttle grip 70, and is opened and closed, the subthrottle valve 52 which are opened and closed by motorised according to an engine operation situation, and the injector 53 for injecting a fuel are formed in each. Said subthrottle valve 52 is arranged rather than the Maine throttle valve 51 at the improvement style side in the method of air flowing, and said injector 53 is arranged at the air flow direction downstream of said Maine throttle valve 51.

[0035] As said throttle body bodies 50a, 50b, 50c, and 50d are shown in drawing 6, the free passage ways 59a and 59b which open the adjacent throttle body bodies 50a and 50b and the throttle body bodies 50c and 50d for free passage are formed. Said free passage ways 59a and 59b are formed on the same flat surface as the flat surface in which the revolving shaft 55 of the Maine throttle valve 51 between the Maine throttle valve 51 and the subthrottle valve 52 and the revolving shaft 58 of the subthrottle valve 52 are formed, and are opening throttle path 50e between said Maine throttle valves 51 and subthrottle valves 52 for free passage.

[0036] Said Maine throttle valve 51 is attached in the rotation shaft 55 attached in a throttle body 50 free [rotation] in one. As shown in drawing 4, the Maine throttle pulley 56 for operating the Maine throttle valve 51 is formed in 1 side edge section 55a of throttle body 50 periphery of said rotation shaft 55 in one with this rotation shaft 55. Moreover, the throttle position sensor 57 for checking the operating state of the Maine throttle valve 51 is formed in another side edge 55b of throttle body 50 periphery of said rotation shaft 55.

[0037] Said Maine throttle pulley 56 operates through the throttle wire (illustration abbreviation) by which push length is carried out by actuation of the throttle grip 70 which an operator operates being interlocked with, and it is made to have the Maine throttle valve 51 opened and closed. The amount of the air inhaled into a combustion chamber 36 by opening accommodation of this Maine throttle valve 51 is adjusted.

[0038] Said subthrottle valve 52 is attached in the rotation shaft 58 attached in a throttle body 50 free [rotation] in one. The cam lever 60 for transmitting actuation

of said subthrottle valve 52 is arranged at 1 side edge section 58a of throttle body 50 periphery of said rotation shaft 58. Moreover, another side edge 58b of throttle body 50 periphery of said rotation shaft 58 is connected with the motor 54 for a drive of said subthrottle valve 52 through actuation cable 54a. Said motor 54 is installed more back than the location where the inhalation-of-air path 47 of the engine 30 of a main frame 2b medial surface is arranged.

[0039] While the stopper cam 61 for adjoining said Maine throttle pulley 56 and rotating this Maine throttle pulley 56 is installed in periphery 1 flank of said throttle body 50 free [rotation], contiguity installation of the rotation of the middle cam 64 is enabled between said stopper cams 61 and said cam levers 60.

[0040] Maine throttle-valve right-hand-side 61b projects in stopper section 56a formed in said Maine throttle pulley 56 in one, and the location which counters, and said stopper cam 61 is formed in it while contact section 61a is projected and formed in a part of middle cam 64 and the location which counters. First idle adjusting-bolt 61c is attached in said Maine throttle-valve right-hand-side 61b, and the opening of the Maine throttle valve 51 at the time of the first idle control at the time of starting between the colds is adjusted by setting up a contact location with said stopper section 56a according to the amount of protrusions of this first idle adjusting-bolt 61c.

[0041] It counters with stopper section 56a of said Maine throttle pulley 56, the bulb justification bolt 66 is formed, said stopper section 56a and said this bulb justification bolt 66 contact at the time of the close by-pass bulb completely of the Maine throttle valve 51, and the opening of the Maine throttle valve 51 is adjusted.

[0042] Cam right-hand-side 64b which contacts contact section 61a of said stopper cam 61 projects in the shape of radii, and said middle cam 64 is formed while end section 64a of the periphery is projected and formed in said cam lever 60 and abbreviation parallel. The end section 64a and end section 60a of a cam lever 60 are connected free [rocking] through the link bar 62. That is, the link mechanism 65 consists of a cam lever 60, a link bar 62, and a middle cam 64.

[0043] Next, the actuation of the Maine throttle valve 51 of an inhalation-of-air control device and the subthrottle valve 52 concerning this operation gestalt is explained with reference to a drawing. The throttle body block diagram in which (a) of drawing 7 shows the condition of a link mechanism in case a subthrottle valve is in a close-by-pass-bulb-completely condition, and (b) are throttle body block diagrams in which a subthrottle valve shows actuation of the link mechanism at the time of being in a full open condition.

[0044] First, as an engine shows (a) of drawing 7 at the time of a halt, the subthrottle valve 52 is in a close-by-pass-bulb-completely condition, and said subthrottle valve 52 is arranged on drawing at the abbreviation horizontal. Moreover, cam right-hand-side 64b of the middle cam 64 is arranged in the location

which does not touch contact section 61a of the stopper cam 61. At this time, the Maine throttle valve 51 is in a close-by-pass-bulb-completely condition, and stopper section 56a has positioned the Maine throttle valve 51, where the bulb justification bolt 66 is contacted. Said stopper section 56a and first idle adjusting-bolt 61c have not contacted.

[0045] Next, as shown in (b) of drawing 7 at the time of starting between the engine colds, it is wide opened by the abbreviation [which will be in a full open condition, rotates said subthrottle valve 52 90 abbreviation counterclockwise, and is shown on drawing] perpendicular [the subthrottle valve 52] condition. While a cam lever 60 rocks 90 abbreviation counterclockwise in connection with it, the link bar 62 can draw near to a cam lever 60 side. And this middle cam 64 rotates because end section 64a of the middle cam 64 rocks counterclockwise to a cam lever 60 side, and cam right-hand-side 64b rocks to **** going up counterclockwise shown on drawing.

[0046] At this time, said cam right-hand-side 64b contacts contact section 61a, and the stopper cam 61 is clockwise rotated 15 abbreviation by rotating up further. And it rocks clockwise to the stopper section 56a side, first idle adjusting-bolt 61c and stopper section 56a contact, and Maine throttle-valve right-hand-side 61b carries out minute include-angle rocking of this stopper section 56a counterclockwise further. This rotates the Maine throttle valve 51 in the direction which carries out minute include-angle disconnection counterclockwise. Thus, the Maine throttle valve 51 can be opened whenever [required for first idle fine corniculus] (for example, one abbreviation) by making the subthrottle valve 52 full open at the time of starting between the engine colds.

[0047] and after performing predetermined time idling operation after engine starting, the subthrottle valve 52 is rotated clockwise -- having -- again -- abbreviation -- it is returned to a level location. In connection with it, while the middle cam 64 rocks clockwise, the contact to cam right-hand-side 64b and contact section 61a is canceled, and in response to the energization force of a return spring 67, the stopper cam 61 is returned counterclockwise. And by returning first idle adjusting-bolt 61c, it is clockwise returned until stopper section 56a contacts the bulb justification bolt 66. Thus, the Maine throttle valve 51 can be made into the usual operational status.

[0048] Next, the inspiration in the inhalation-of-air control unit concerning this operation gestalt is explained. As shown in drawing 6, the fuel injection engine concerning this operation gestalt is a four stroke cycle engine of a 4-cylinder, and firing order of each gas column is performed in 1st cylinder -> 3rd cylinder -> 2nd cylinder -> cylinder [4th] sequence. At this time, the 1st adjacent cylinder, the 2nd cylinder, the 3rd cylinder, and the 4th cylinder of 180-degree phase contrast have arisen like the inhalation-of-air line, respectively. That is, when there is one gas column like an inhalation-of-air line, there is a gas column of another side like an

expansion line, and the intake valve is closed.

[0049] Since the subthrottle valve 52 has closed at the time of low-speed rotation of an engine, the same abbreviation closed space as a chamber room is formed between the Maine throttle valve 51 of the gas column of the other side, and the subthrottle valve 52. Inhalation-of-air pulsation declines by inhalation of air being introduced into this closed space.

[0050] Moreover, since the subthrottle valve 52 has been arranged at the upstream of the Maine throttle valve 51 and the subthrottle valve 52 has closed at the time of low-speed rotation of an engine, it blows and gas does not attain even an air cleaner 12. Therefore, early dirt of an air cleaner 12 can be prevented.

[0051] Furthermore, since throttle path 50e between adjacent Maine throttle valves 51 of the throttle body bodies 50a and 50b and subthrottle valves 52 is opened for free passage through free passage way 59a and the inhalation-of-air line of one gas column can incorporate air from the throttle body of the gas column of the other side through free passage way 59a more by the way, a throttle body 50 can secure an inhalation-of-air flow rate.

[0052] In this way, while being able to decrease inhalation-of-air pulsation further since an inhalation-of-air flow rate is securable, and the subthrottle valve 52 can be closed further, an inhalation-of-air sound can be reduced. The property Fig. which compared fluctuation of the torque by ** and nothing with drawing 8 in the inhalation-of-air control unit is shown. [of a free passage way] It turns out that the direction of the inhalation-of-air control unit which prepared the free passage way is a smooth torque characteristic so that clearly now.

[0053] Since it constituted as mentioned above, according to this operation gestalt, an engine 30 as a four-cycle juxtaposition 4-cylinder engine arranged in order from the 1st cylinder to the 4th cylinder Since firing order of each gas column was made into 1st cylinder -> 3rd cylinder -> 2nd cylinder -> cylinder [4th] sequence and the throttle body bodies 50a, 50b, 50c, and 50d have arranged in parallel and arranged it corresponding to each gas column The free passage ways 59a and 59b which open the adjacent throttle body bodies 50a and 50b and the throttle body bodies 50c and 50d for free passage can consist of short distance.

[0054] Moreover, since said free passage ways 59a and 59b were formed on the same flat surface as the flat surface established in the revolving shaft 55 of the Maine throttle valve 51 between the Maine throttle valve 51 and the subthrottle valve 52, and the revolving shaft 58 of the subthrottle valve 52 according to this operation gestalt, the space-saving configuration using dead space is realizable in the range in which a throttle body 50 is constituted in the free passage structure of a throttle body.

[0055] Moreover, according to this operation gestalt, since the Maine throttle valve 51 and the subthrottle valve 52 were made to interlock by the link mechanism 65,

only an include angle required for a first idle with an easy configuration can open the Maine throttle valve 51. Moreover, since first idle adjusting-bolt 61c was prepared in the stopper cam 61, fine adjustment of the open include angle of the Maine throttle valve 51 at the time of a first idle can be performed. Furthermore, not only the open opening of the Maine throttle valve but an open initiation stage can be set as arbitration by adjustment of said first idle adjusting-bolt 61c.

[0056] Moreover, improvement in engine startability can be aimed at, without needing a choke lever, since according to this operation gestalt a coolant temperature sensor detects the engine condition at the time of engine starting and it was made to perform a first idle fixed time.

[0057] According to this operation gestalt, since the cam lever 60, the stopper cam 61, and the middle cam 64 were adjacently collected to one flank of a throttle body 50, the whole throttle body can be miniaturized without enlarging each component part, and, moreover, actuation nature of a bulb can be made good. Moreover, since the motor and throttle position sensor for a subthrottle-valve drive have been arranged to the same throttle body side, while an electrical-related harness is made all together and being able to improve workability, the circumference of equipment can be simplified.

[0058] Moreover, according to this operation gestalt, the amount of compulsive rotation of the Maine throttle valve 51 by the stopper cam 61 can be performed to arbitration, where the subthrottle valve 52 is maintained to full open at the time of idling operation under first idle control. At the time of an idling, since the Maine throttle valve 51 has closed, even if it makes the subthrottle valve 52 full open, it is not influenced. Therefore, the amount of compulsive rotation by the cam can be finely tuned in this condition.

[0059] In addition, with this operation gestalt, it has the 4th cylinder for the configuration of an engine 30 from the 1st cylinder. Although the free passage ways 59a and 59b which open for free passage the throttle body bodies 50a and 50b which the throttle body bodies 50a, 50b, 50c, and 50d stand in a row, arrange, and adjoin each other, and the throttle body bodies 50c and 50d corresponding to each gas column are constituted The configuration which the configuration of the free passage way of this invention is not limited to this, and opens the throttle body bodies 50a and 50d and the throttle body bodies 50b and 50c for free passage, Or you may consider as the configuration which opens altogether the throttle body bodies 50a, 50b, 50c, and 50d for free passage.

[0060] Moreover, with this operation gestalt, although the configuration of the free passage ways 59a and 59b should be formed in one with the throttle body, as long as it is not limited to the configuration method of a free passage way and opens a throttle body body for free passage, the communicating tube using the pipe member constituted with another object or a hose member or a free passage hose may be

used for this invention, for example. According to this method, the advantage that a degree of freedom can be given is in a free passage path.

[0061] Moreover, although the link mechanism is adopted as the interlock of the Maine throttle valve 51 and the subthrottle valve 52, this invention is not limited to this and you may make it transmit actuation of each throttle valve with this operation gestalt using the thing each throttle valve was made to be interlocked with an interlock using a chain, and a gear.

[0062]

[Effect of the Invention] As explained, according to the inhalation-of-air control device of the fuel-injection type engine of this invention according to claim 1 to 4, the structure of a throttle body by as mentioned above, the thing for which a secondary bulb is arranged to the upstream of the Maine throttle valve the time of primary bulb full open -- engine low and middle turn ****** -- the improvement in torque of low medium speed and smooth output characteristics are realizable by closing a secondary bulb moderately with the formation of homogeneity-gaseous mixture, and the improvement in volumetric efficiency and the attenuation of inhalation-of-air pulsation by the improvement in the inhalation-of-air rate of flow. Moreover, the outstanding effectiveness that it can do although it can prevent that inhalation of air blows and gas reaches even an air cleaner element by closing the secondary bulb of the upstream of the Maine throttle valve at the time of low engine speeds is done so.

[0063] Moreover, by preparing the free passage way which opens the throttle paths between adjoining Maine throttle valves of a throttle body and secondary bulbs for free passage, air can be inhaled also from the throttle body of the gas column opened for free passage by the free passage way at the time of the Maine throttle-valve full open at the time of low rotation of an engine, and an inhalation-of-air flow rate can be secured. While being able to become possible to close a secondary bulb further by this, being able to decrease inhalation-of-air pulsation further and being able to realize smooth output characteristics, the outstanding effectiveness that reduction of an inhalation-of-air sound can be aimed at is done so.

[Brief Description of the Drawings]

[Drawing 1] It is the whole side elèvation showing the configuration of the whole motor bicycle with which the engine which adopted the inhalation-of-air control device of the fuel-injection type engine concerning the operation gestalt of this invention was carried.

[Drawing 2] It is the partial cross-section side elevation showing the configuration of said engine.

[Drawing 3] It is the top view showing the configuration of the throttle body in said inhalation-of-air control device.

[Drawing 4] It is A view Fig. of drawing 3 .

[Drawing 5] It is B view Fig. of drawing 3 .

[Drawing 6] It is the C-C cross-section view Fig. of drawing 3 .

[Drawing 7]The throttle body block diagram in which (a) shows the condition of a link mechanism in case a subthrottle valve is in a close-by-pass-bulb-completely condition, and (b) are throttle body block diagrams in which a subthrottle valve shows actuation of the link mechanism at the time of being in a full open condition.

[Drawing 8]It is the property Fig. which compared fluctuation of the torque by ** and nothing in said inhalation-of-air control unit. [of a free passage way]

[Description of Notations]

1 Motor Bicycle

2 Car-Body Frame

30 Engine

50 Throttle Body

50a, 50b, 50c, 50d Throttle body body

50e Throttle path

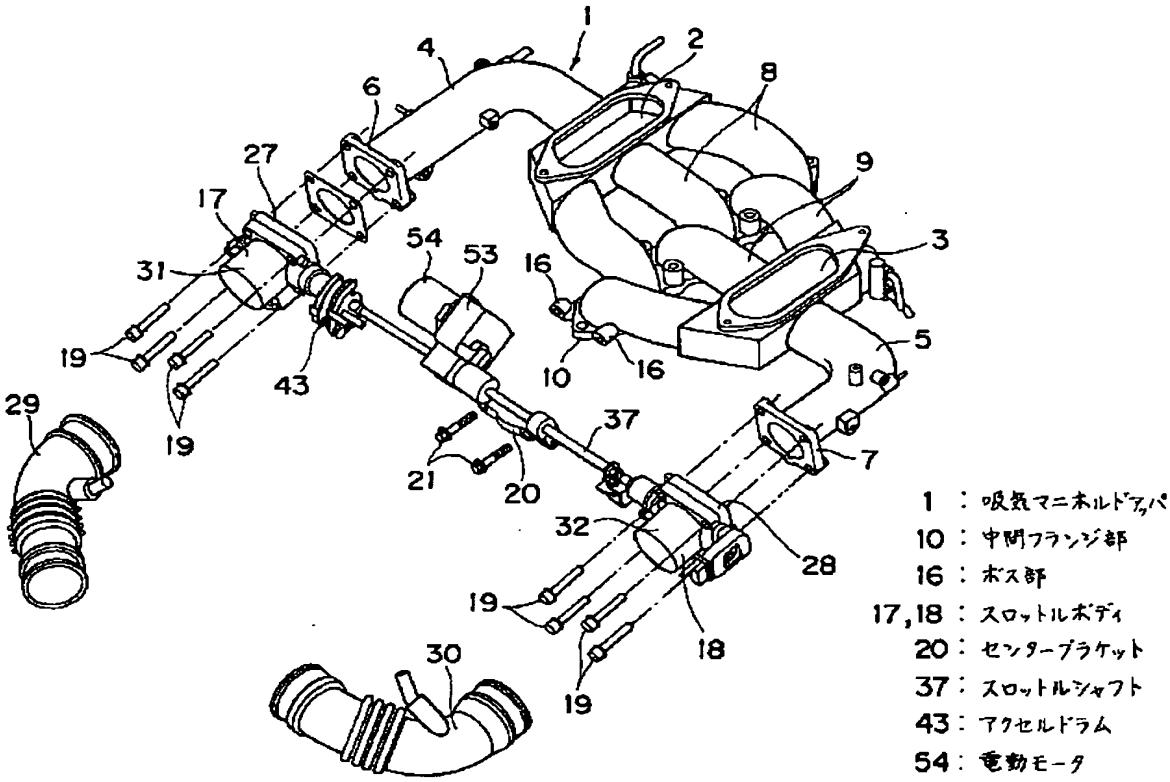
51 Maine Throttle Valve

52 SubThrottle Valve

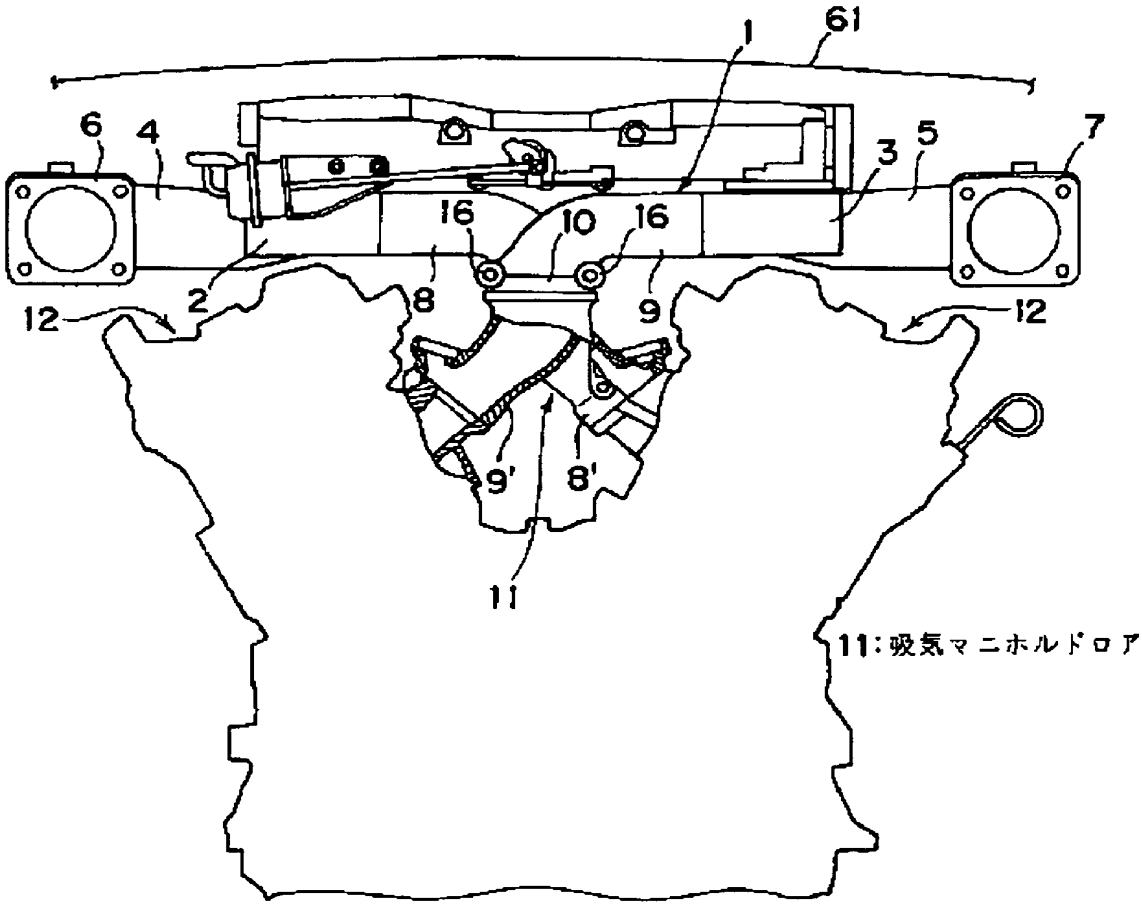
59a, 59b Free passage way

100 Inhalation-of-Air Control Unit

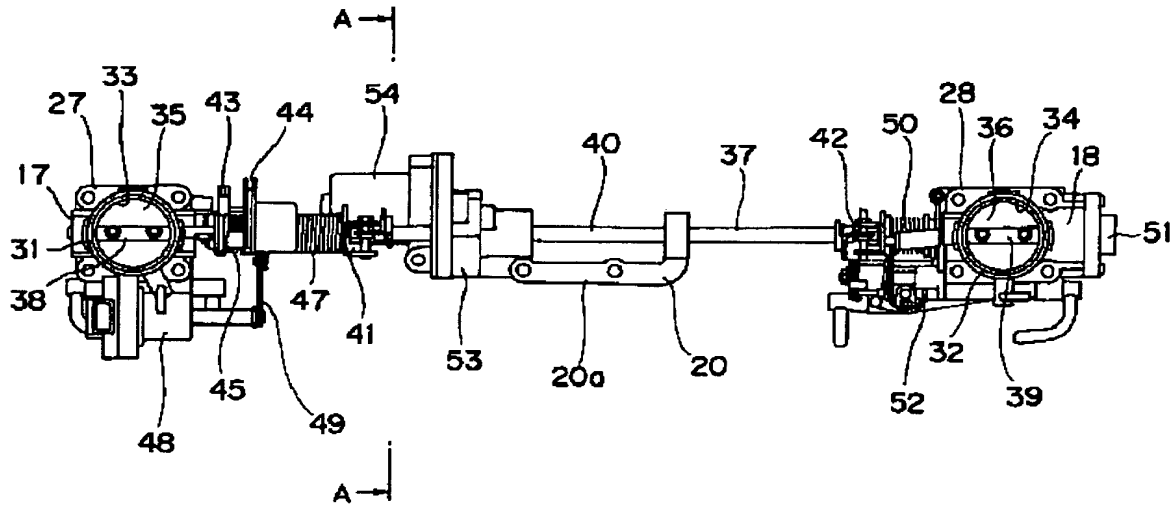
[Drawing 1]


1 : 吸気マニホルドアッパ
10 : 中間フランジ部
16 : ボス部
17,18 : スロットルボディ
20 : センターブラケット
37 : スロットルシャフト
43 : アクセルドラム
54 : 電動モータ

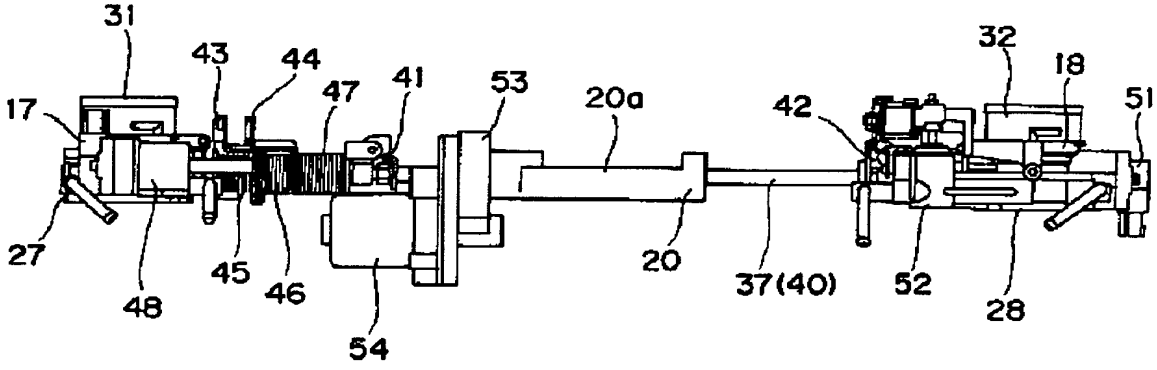
[Drawing 2]



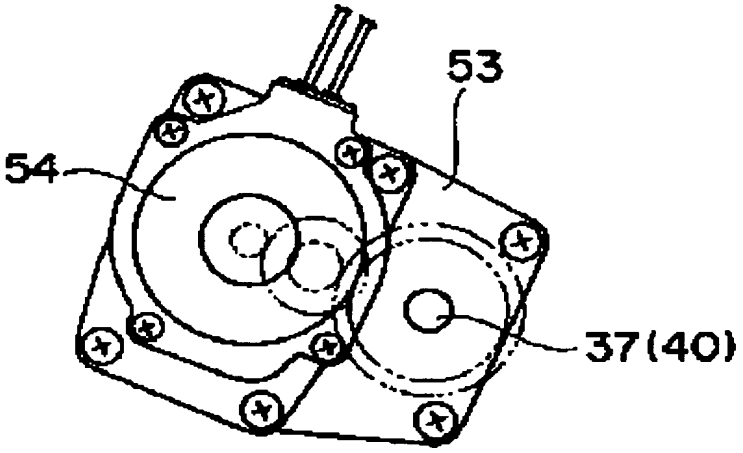
[Drawing 3]



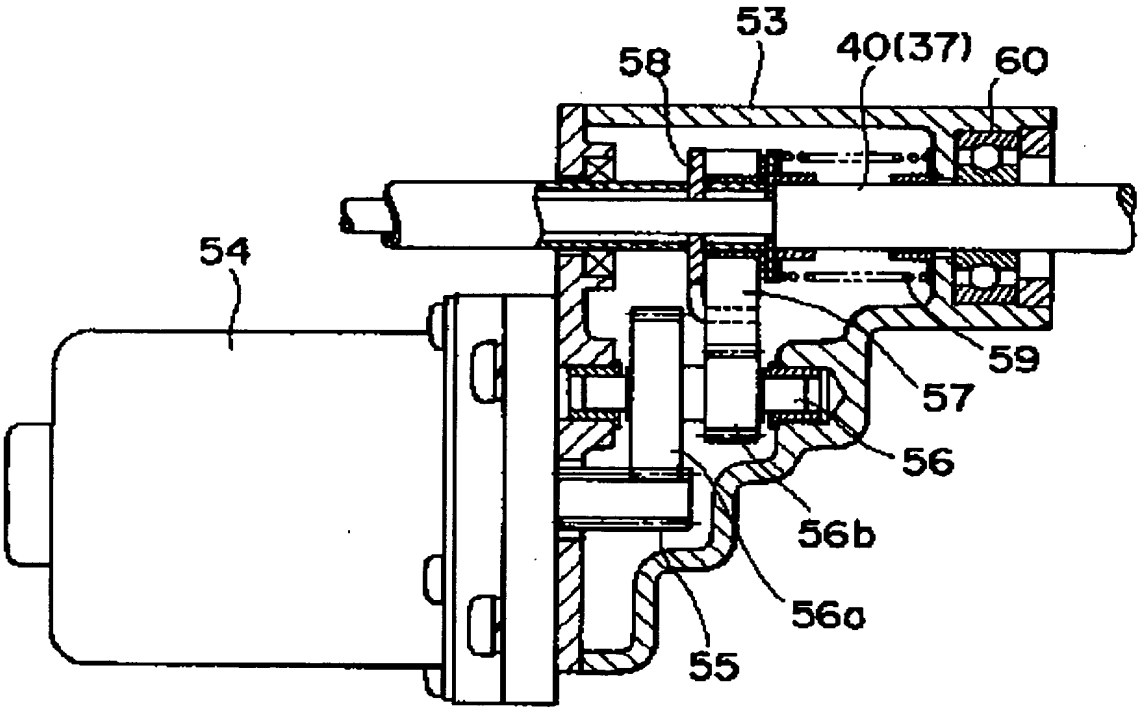
[Drawing 4]



[Drawing 5]



[Drawing 6]



[Drawing 7]